Sanitary Couplings:

EHEDG and 3-A

Development of a Technical Resource Paper by:

Andy Timperley

Timperley Consulting

Timperley Consulting

The Most Frequently Used Element of Construction in Food Processing Installations and Equipment.

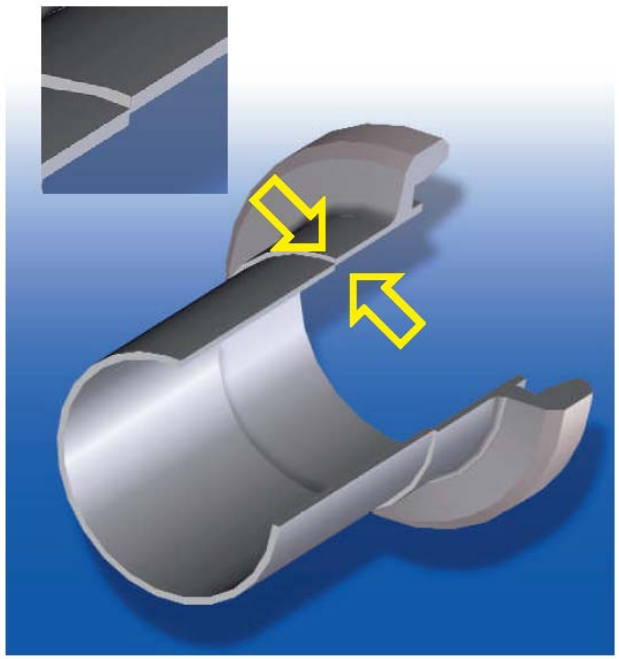
Required Characteristics for the Sealing System

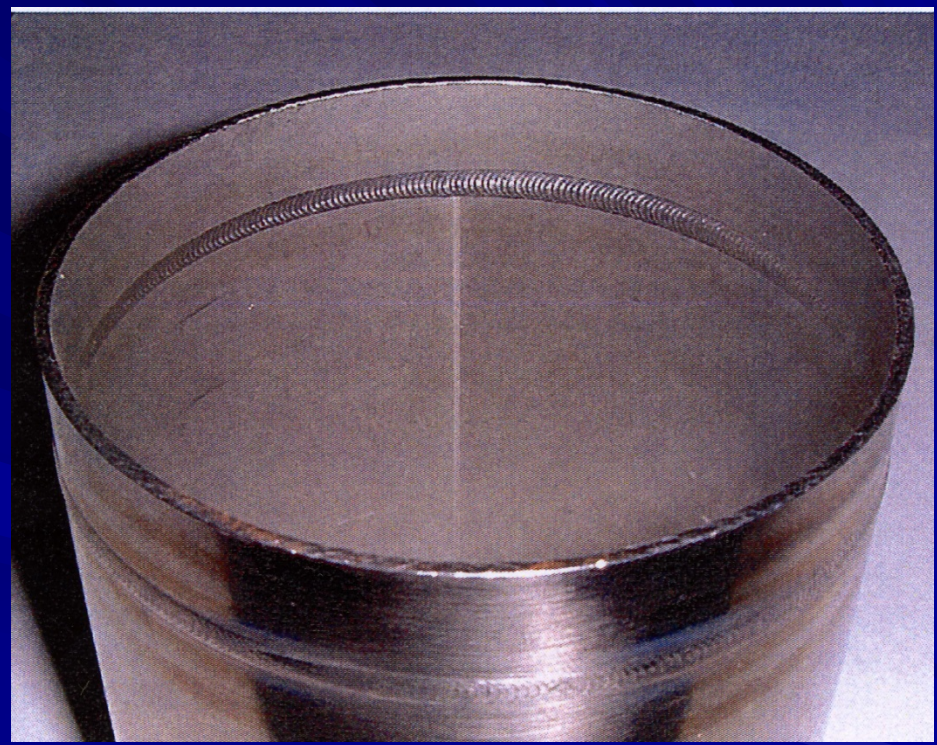
- Prevent retention of product soils and penetration of bacteria.
- Cleanability; Mechanical (CIP) or Manual
- Easy Installation and Maintenance
- Reliability; Product, Chemical and Temperature Resistance
- Prevent excessive misalignment and ensure sufficient compression of the seal.
- Provide controlled compression to reduce extrusion/ crevices to an absolute minimum.

Critical Design Parameters.

- Resilient Gasket Material; Elastomers ≥70° Shore A. Consider use of plastic materials.
- Surface Roughness; Metal faces ≤ 0.8 µm/32µ inch Ra. Gasket surface as smooth as possible
- Contact Pressure; 1.5 – 2.5 N/mm^2 for elastomers, plastic materials may require greater contact pressure.
- Friction and Stress; Avoid sliding during compression and tensile stress. Limit compression of elastomer to 20 -25%
- Expansion Rate; Elastomers ~15 x that of Stainless Steel. Minimise elastomer volume, provide bi-directional expansion possibility with room to accommodate deformed gasket
- Recess and Protrusion; 3-A ± 0.8 mm/31 thou', ASME BPE ± 0.5 mm/20 thou', EHEDG ± 0.2 mm/8 thou'
- Tolerances; Location of coupling halves, compression of gasket and inside diameters

Dimensions and Tolerances for Internal Diameters of Mating Tubes





Matching internal diameters and orbital welding used to ensure flush transition between pipe and fitting.

‘Food and Dairy’ Tubing Standards and Dimensions.

	BS 4825	ISO 2037 / 2851	A 270	Dutch inch
1/4"			6,35x0,89	
3/8"			9,53x0,89	
		12x1		
1/2"	12,7x1,2	12,7x1	12,7x1,65	
	15,88x1,2	17,2x1		
3/4"	19,05x1,2		19,05x1,65	
		21,3x1		
1"	25,4x1,6	25x1,2 en 1,6	25,4x1,65	25,4x1,25
		33,7x1,2 en 1,6		
1 1/4"				31,8x1,25
1 1/2"	38,1x1,6	38x1,2 en 1,6	38,1x1,65	38,1x1,5
		40x1,2 en 1,6		
2"	50,8x1,6		50,8x1,65	50,8x1,5
		51x1,2 en 1,6		
2 1/2"	63,5x1,6	63,5x1,6	63,5x1,65	63,5x1,5
		70x1,6		
3"	76,2x1,6	76,1x1,6	76,2x1,65	76,1x1,5
		88,9x2		
4"	101,6x2	101,6x2	101,6x2,11	101,6x2
	114,3x2	114,3x2		
	139,7x2	139,7x2		
6"			152,4x2,77	
	168,3x2,6	168,3x2,6		
	219,1x2,6	219,1x2,6		

DIN 11850	Serie 1	Serie 2	Serie 1/2
NW10	12x1	13x1,5	12x1,5
NW15	18x1	19x1,5	18x1,5
NW20	22x1	23x1,5	22x1,5
NW25	28x1	29x1,5	28x1,5
NW32	34x1	35x1,5	34x1,5
NW40	40x1	41x1,5	40x1,5
NW50	52x1	53x1,5	52x1,5
NW65	70x2		
NW80	85x2		
NW100	104x2		
NW125	129x2		
NW150	154x2		
NW200	204x2		

‘Industrial’ Tubing Standards and Dimensions.

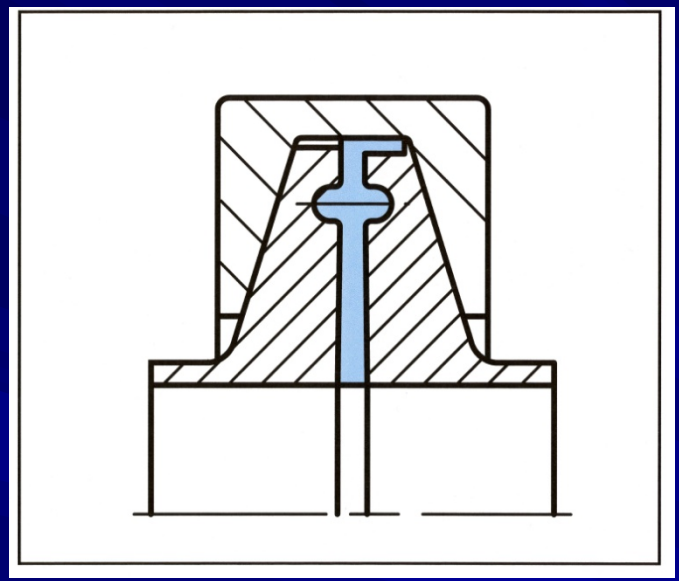
Industrial tubes										
	ASTM A-312			ISO 1127				DIN / METRIC		
Size	SCH5S	SCH10S	SCH40S							
	-	-	-	-	-	-	-	8x1	-	-
	-	-	-	-	-	-	-	10x1	-	-
1/4"/NW8	-	13,72x1,65	-	-	13,5x2,3	-	-	12x1	12x1,5	-
3/8"/NW10	-	17,15x1,65	-	17,2x1,6	17,2x2,3	-	-	18x1	18x1,5	-
1/2"/NW15	21,34x1,65	21,34x2,11	21,34x2,77	21,3x1,6	21,3x2	21,3x2,6	-	-	22x1,5	-
3/4"/NW20	26,67x1,65	26,67x2,11	26,67x2,87	26,9x1,6	26,9x2	26,9x2,65	-	-	25x1,5	25x2
1"/NW25	33,4x1,65	33,4x2,77	33,4x3,38	33,7x1,6	33,7x2	-	33,7x3,25	28x1	28x1,5	30x2
1 1/4"/NW32	42,16x1,65	42,16x2,77	42,16x3,56	42,4x1,6	42,4x2	42,4x2,6	42,4x3,25	40x1	40x1,5	40x2
1 1/2"/NW40	48,26x1,65	48,26x2,77	48,26x3,68	48,3x1,6	48,3x2	48,3x2,6	48,3x3,25	-	-	44,5x2
2"/NW50	60,33x1,65	60,33x2,77	60,33x3,91	60,3x1,6	60,3x2	60,3x2,6	60,3x3,65	52x1	52x1,5	54x2
2 1/2"/NW65	73,03x2,11	73,03x3,05	-	76,1x1,6	76,1x2	76,1x2,9	76,1x3,65	-	-	70x2
3"	88,9x2,11	88,9x3,05	88,9x5,49	88,9x1,6	88,9x2	88,9x2,9	88,9x4,05	-	83x1,5	84x2
3 1/2"	101,6x2,11	101,6x3,05	101,6x5,74	-	101,6x2	-	-	-	103x1,5	104x2
4"/NW100	114,3x2,11	114,3x3,05	114,3x6,02	114,3x1,6	114,3x2	114,3x2,6	114,3x3,6	-	-	108x2
5"/NW125	141,3x2,77	141,3x3,4	-	139,7x2	139,7x2,6	139,7x3		-	-	129x2
6"/NW150	168,28x2,77	168,28x3,4	168,28x7,11	168,3x2	168,3x2,6	168,3x3	168,3x4	-	153x1,5	154x2
8"/NW200	219,08x2,77	219,08x3,76	219,08x8,18	219,1x2	219,1x2,6	219,1x2,9	219,1x4	-	-	204x2
10"/NW250	273,08x3,4	273,08x4,19	273,08x9,27	273x2	273x2,6	273x3	273x4	-	254x2	256x3
12"/NW300	323,85x3,96	323,85x4,57	323,85x9,53		323,9x2,6	323,9x3	323,9x4	-	-	306x3
14"/NW350	355,6x3,96	355,6x4,78	-	-	355x2,5	356x3	-	-	-	356x3
16"/NW400]	406,4x4,19	406,4x4,78	-	-	-	406x3	-	-	-	406x3

Pipe Joint Systems

- 'Tri-Clamp' Types; ISO 2852, ISO 1127, DIN 32676, BS4825-3, ASME BPE (ISO 2852), SMS 3017 (ISO 2852/DIN 32676) and many hybrid variants manufactured by specific Companies.
- 'O'-Ring Types; DIN 11864 Form A, BS 4825-5 (RJT), Tuchenhagen Varivent® ,Neumo BioConnect®, BBS Quick Connect, plus variants.
- 'Profile Seal' Types; ISO 2853, BS 4825-4 (ISS,IDF 14), DIN 11864 Form B, DIN 11851, SMS 1145, DS 722 and specific manufacturer's variants.
- Metal to Metal Types; Bevel Seat, Neumo ConnectS ®.

This list is not exhaustive.

‘Clamp-Type’ Systems

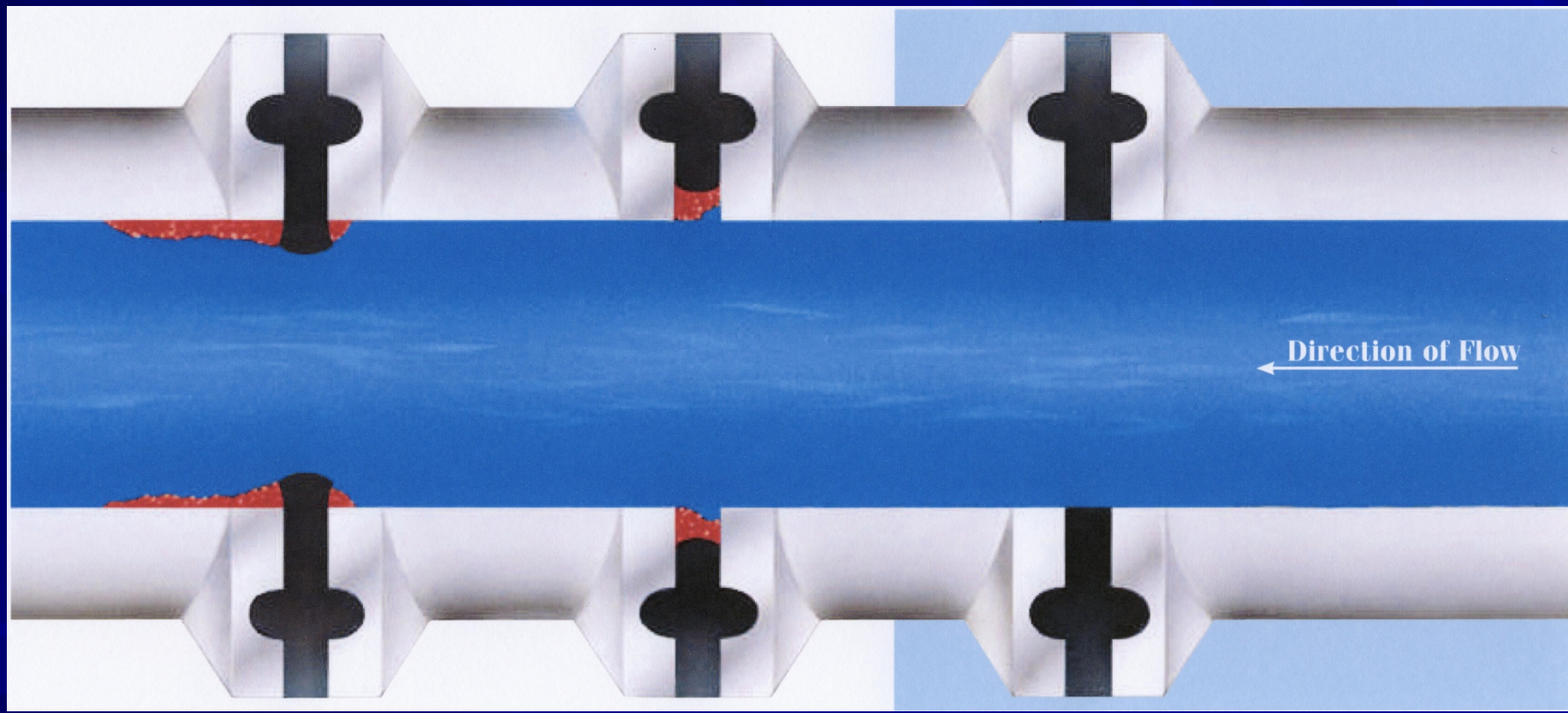


Most commonly used Pipe Joint System.

Complies with 3-A Sanitary Design Criteria for self-centering and locating groove radii (0.4 mm). Compression of gasket critical to ensure joint system is ‘substantially flush’ ± 0.8 mm for mechanical cleaning (CIP).

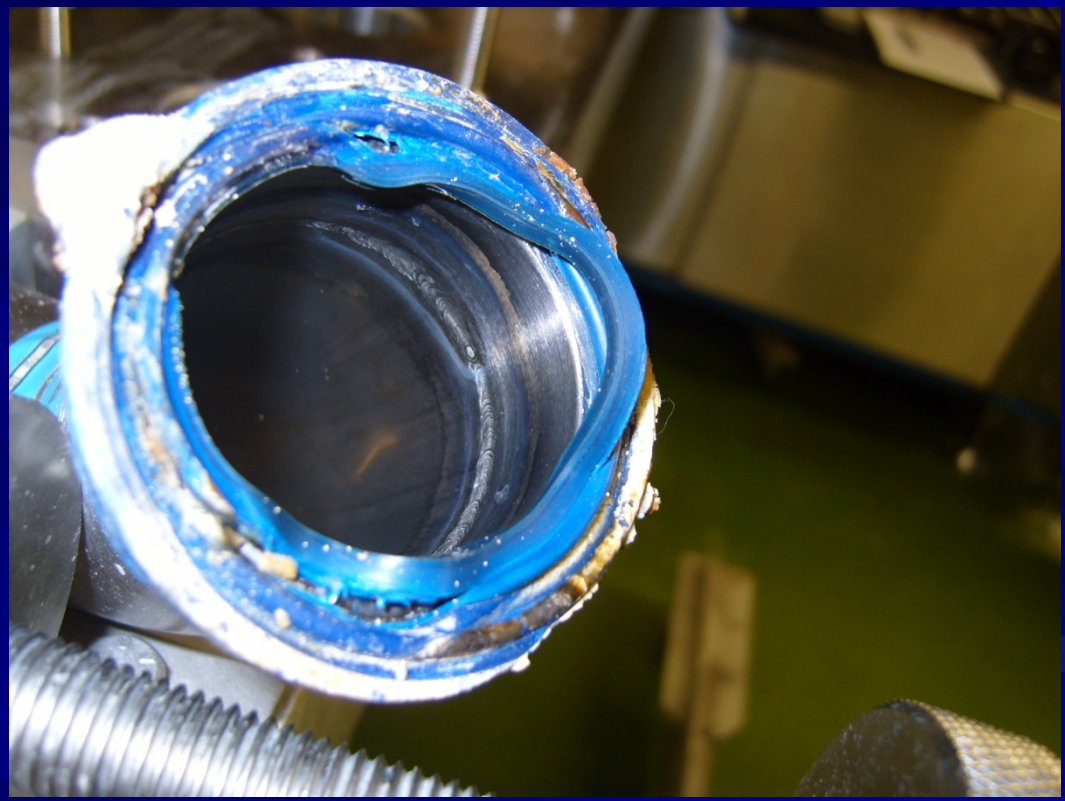
May comply with additional criteria for EHEDG when fitted with alternative gaskets, having controlled compression, and substantially flush ± 0.2 mm.

‘Clamp-Type’ Systems

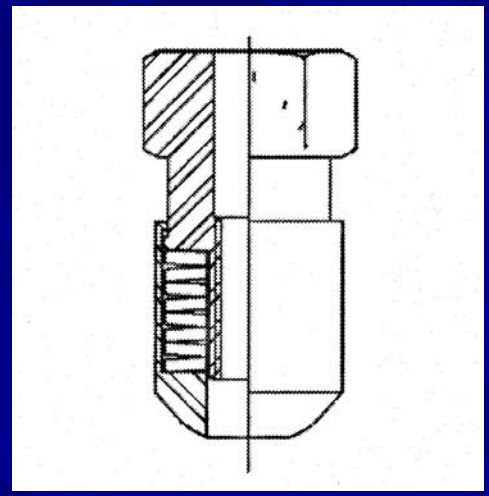


Controlled compression of the gasket is required to prevent cleaning and draining problems.

‘Clamp Type’ Systems



Aftermarket Gaskets and Clamp Systems



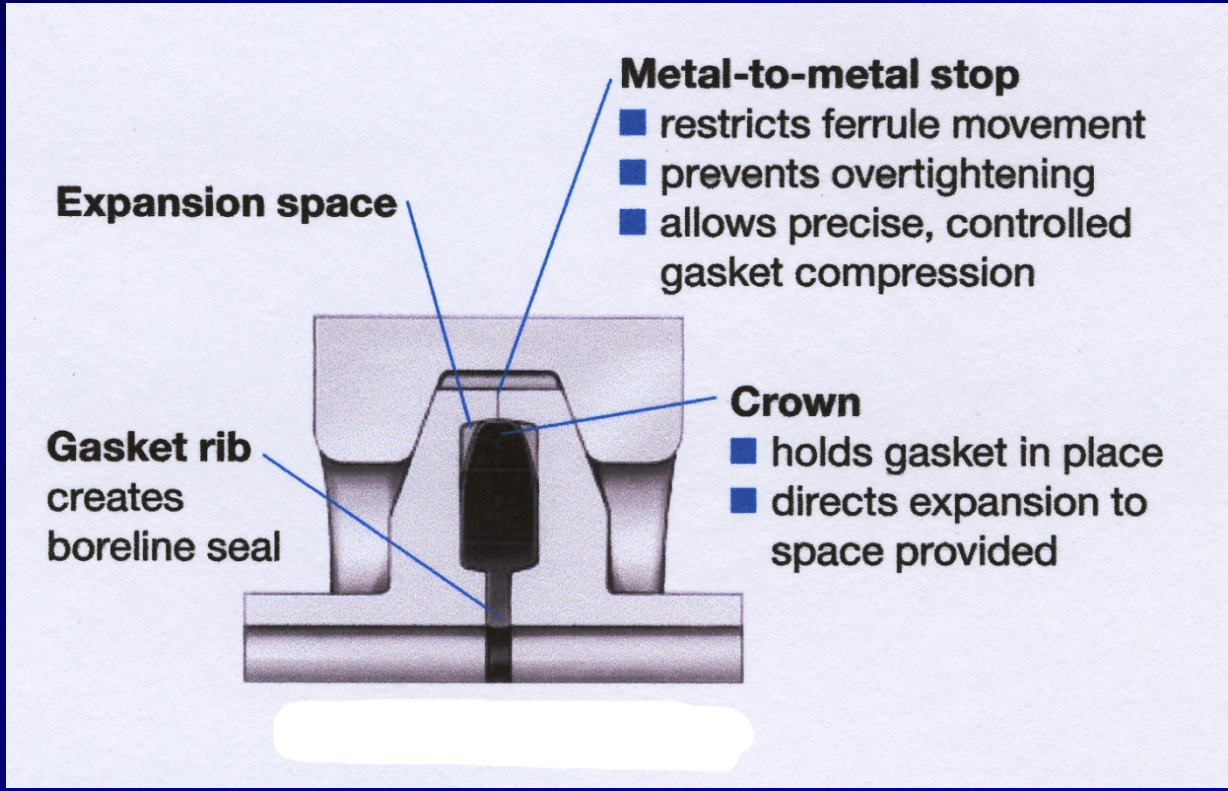
Many types of specialised gaskets are available to limit or control compression:

- Composite Stainless Steel/PTFE.
- Encapsulated Plastic/Elastomer.
- Bonded Stainless Steel/Elastomer
- Plastic, PTFE, PEEK.

Clamping systems used to limit or control compression:

- Torque limiting
- Constant torque

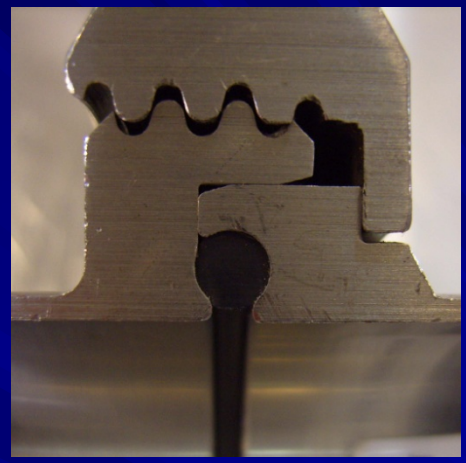
‘Clamp-Type’ Systems

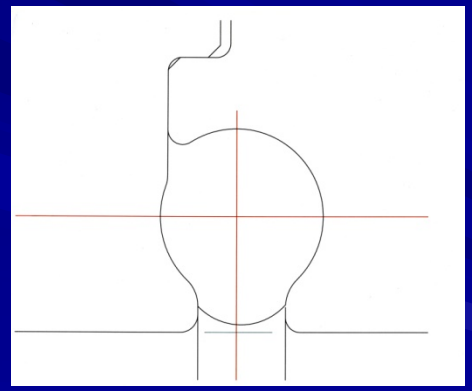


Complies with EHEDG and 3-A Design Criteria.

Successfully tested for CIP-ability. Not the only one!

‘O’-Ring Type Systems



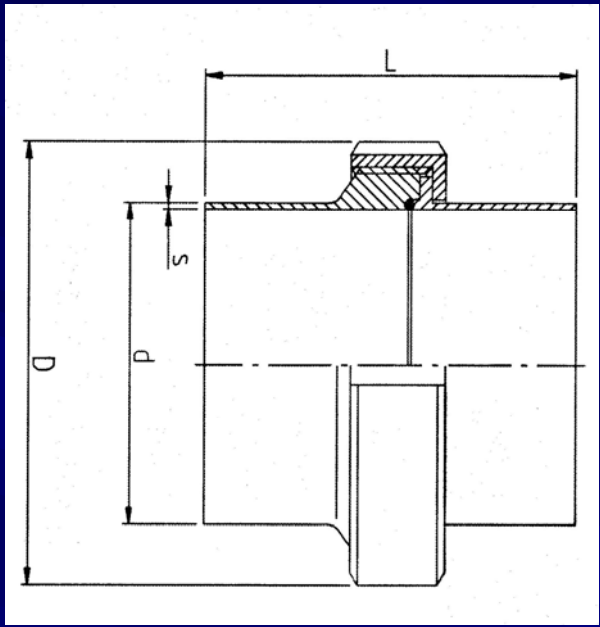


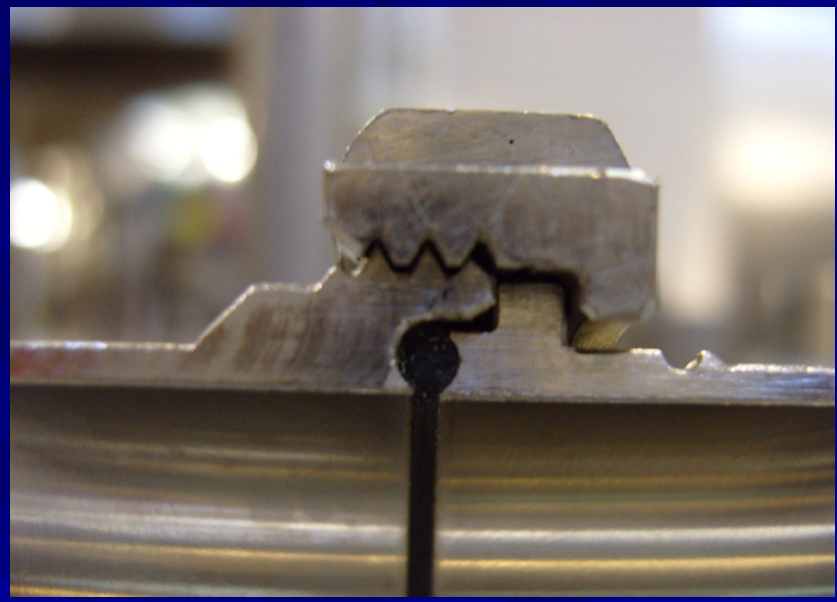
DIN 11864 Form A.

Complies with EHEDG and 3-A Design Criteria.

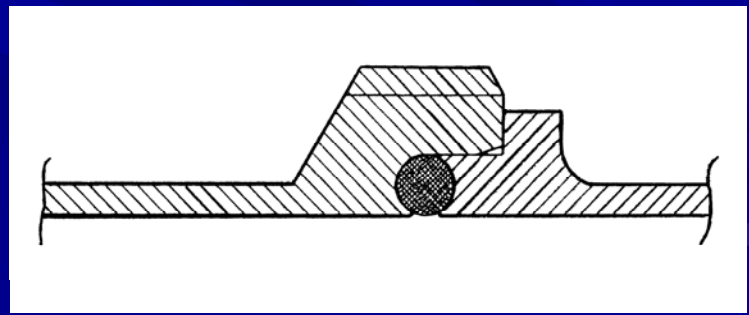
Successfully tested for CIP-ability, steam sterilisability and bacteria tightness (EHEDG Docs. 2, 5 and 7).

‘O’-Ring Type Systems





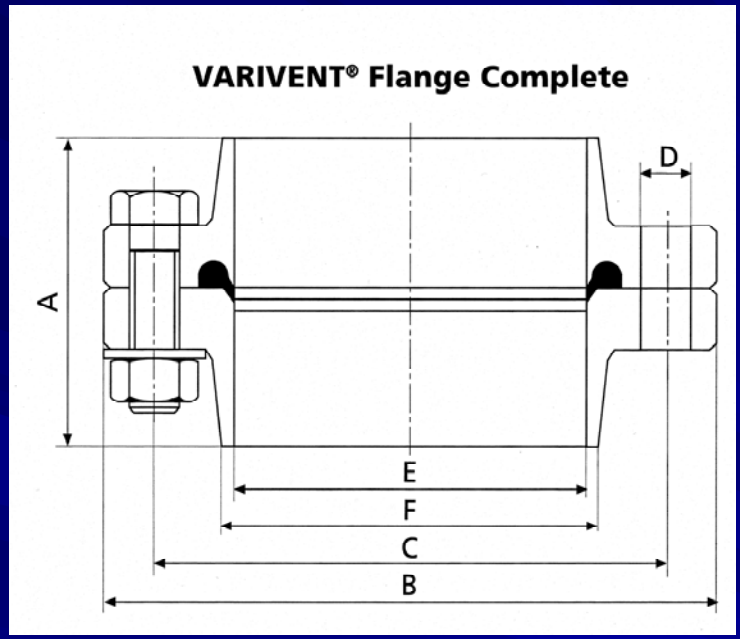
Neumo Bio Connect®.



Complies with EHEDG and 3-A Design Criteria.

Successfully tested for CIP-ability.

‘O’-Ring Type Systems



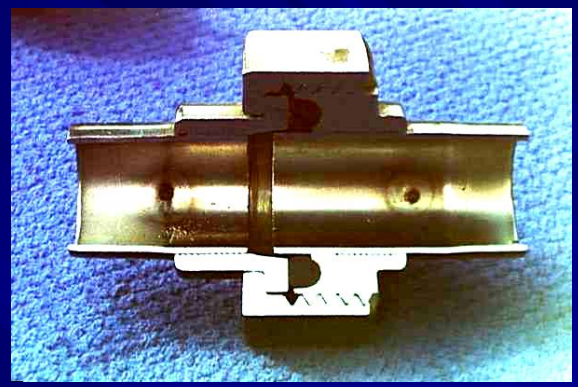
TuchenhagenVarivent®.

Complies with EHEDG and 3-A Design Criteria.

Successfully tested for CIP-ability.

‘O’-Ring Type Systems

BS 4825-5 (RJT).



Does not comply with EHEDG or 3-A Design Criteria for CIP.

Designed for COP cleaning and weld ferrules available.

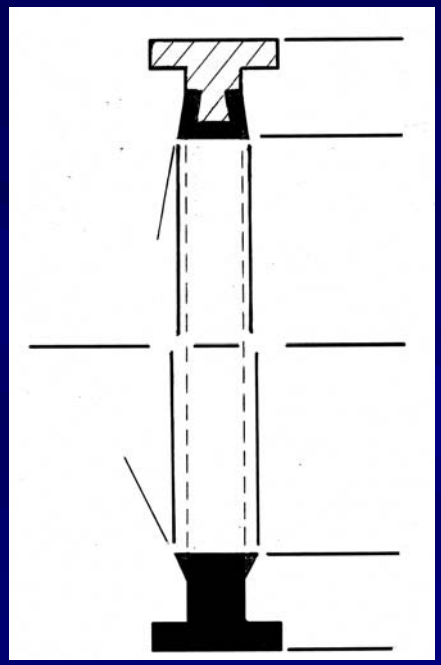
Profile Seal Type Systems

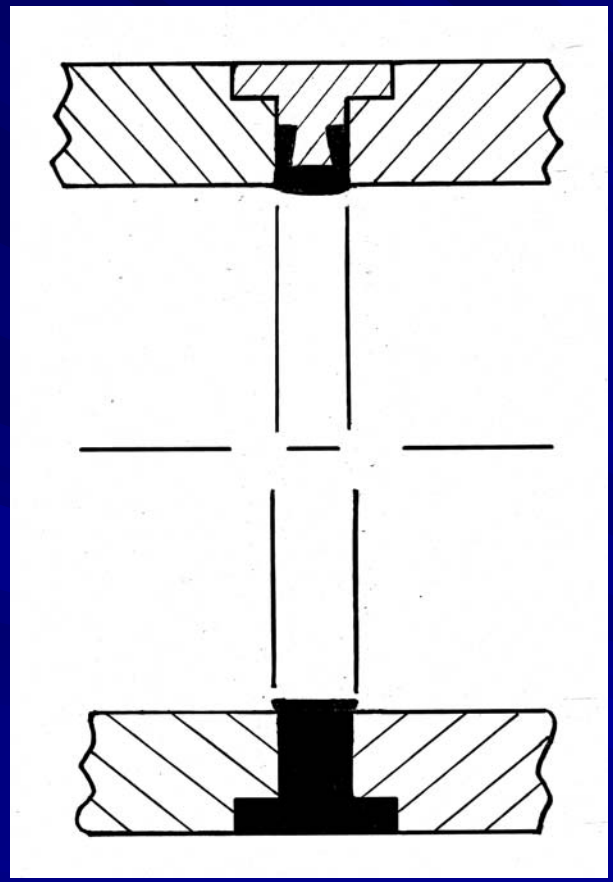
BS 4825-4 (IDF, ISS), ISO 2853

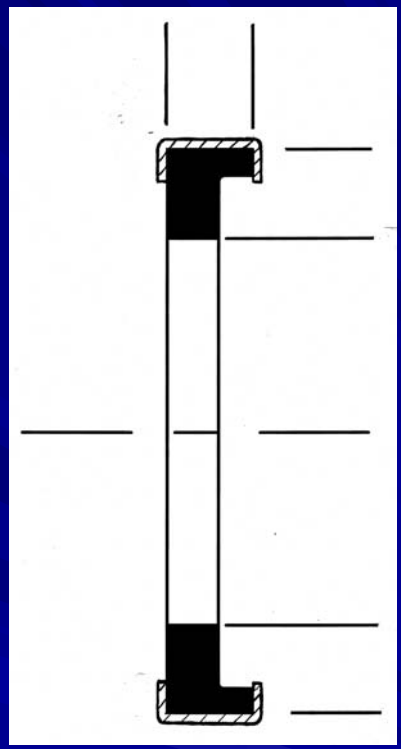
Complies with 3-A Design Criteria for CIP.

Complies with additional criteria for EHEDG when fitted with alternative gaskets. Some versions tested for CIP-ability.

Profile Seal Type Systems



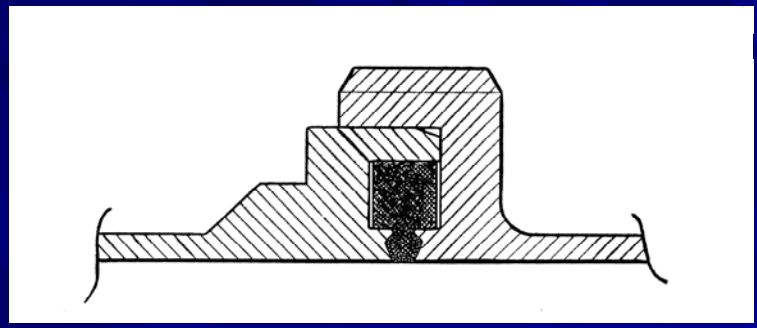


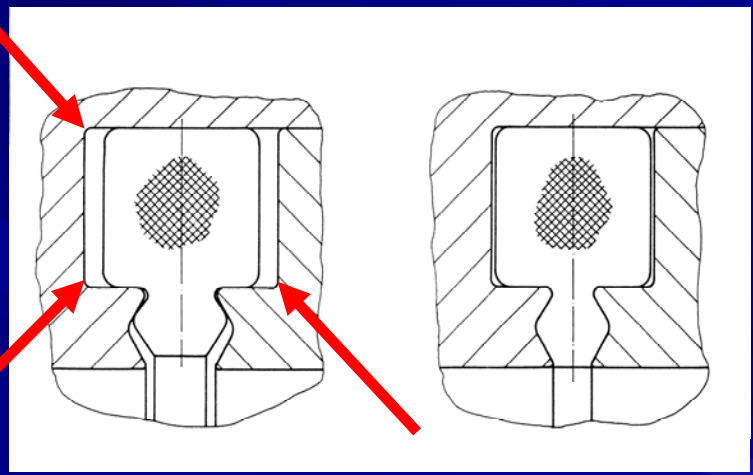


Standard and alternative gaskets available for BS 4825-4 and ISO 2853 systems

Profile Seal Type Systems

DIN 11864 Form B.

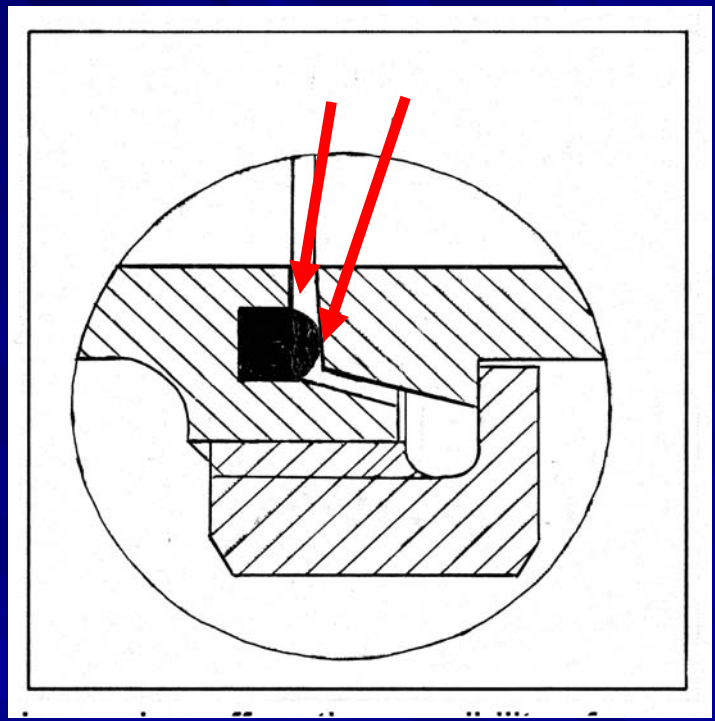




Complies with EHEDG Design Criteria. Complies with 3-A Design Criteria with 0.4 mm radius provided in gasket retaining grooves.

Successfully tested for CIP-ability, steam sterilisability and bacteria tightness (EHEDG Docs. 2, 5 and 7).

Profile Seal Type Systems

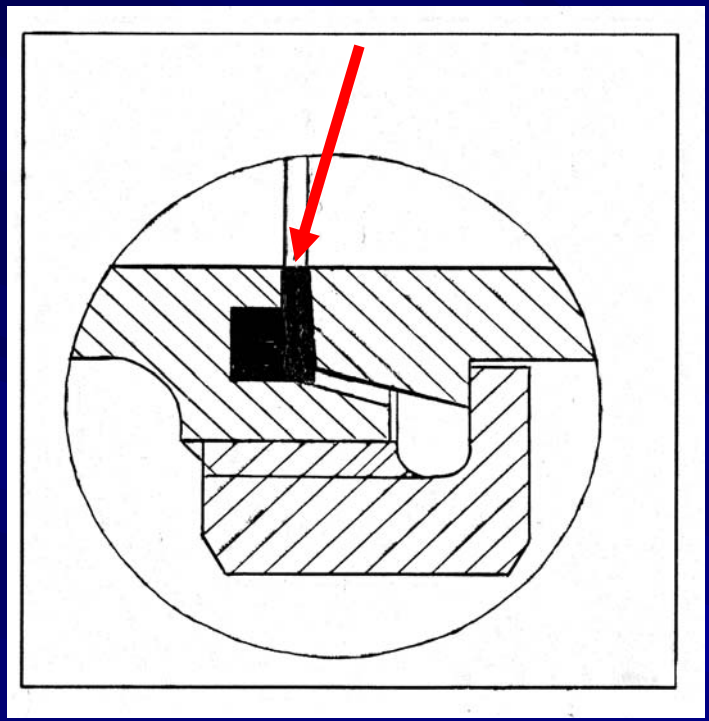


DIN 11851.

Does not comply with 3-A or EHEDG Design Criteria in Standard form.

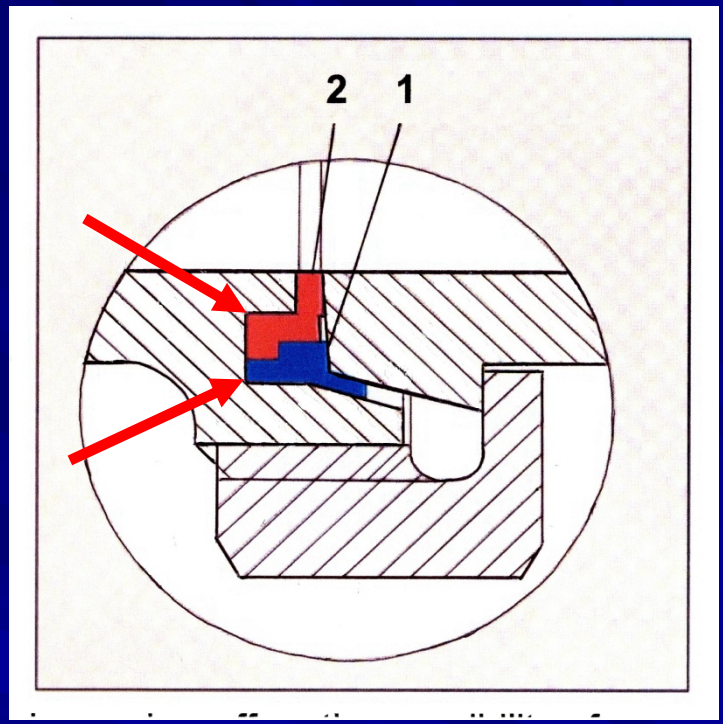
Aftermarket sealing systems available for CIP-ability.

Profile Seal Type Systems



L profile gasket fills crevice but does not provide self-centering.

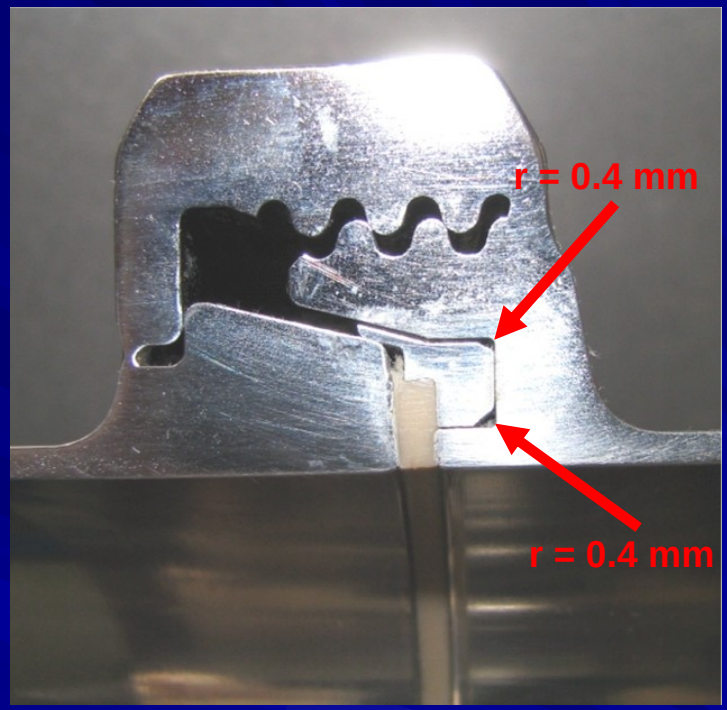
Does not comply with 3-A or EHEDG Sanitary Design Criteria



2-piece metal/elastomer gasket fills crevice and provides self-centering.

Complies with EHEDG Sanitary Design Criteria. Complies with 3-A Sanitary design Criteria with 0.4 mm radius provided in gasket locating groove

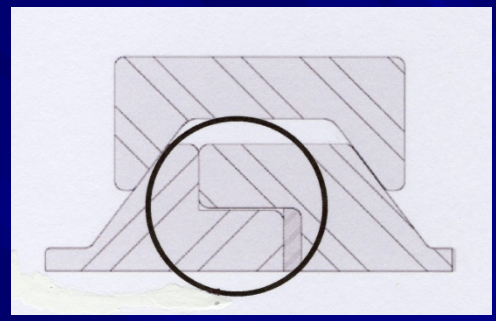
Profile Seal Type Systems

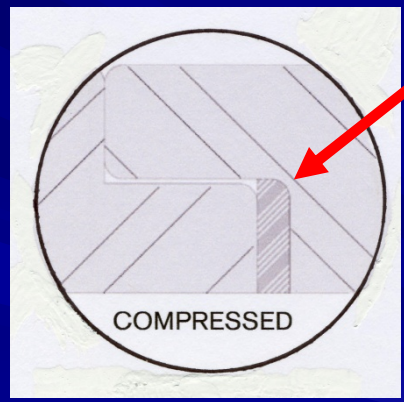


Gasket designs successfully tested for CIP-ability

Profile Seal Type Systems

Cherry Burrell (SPX) I-Line



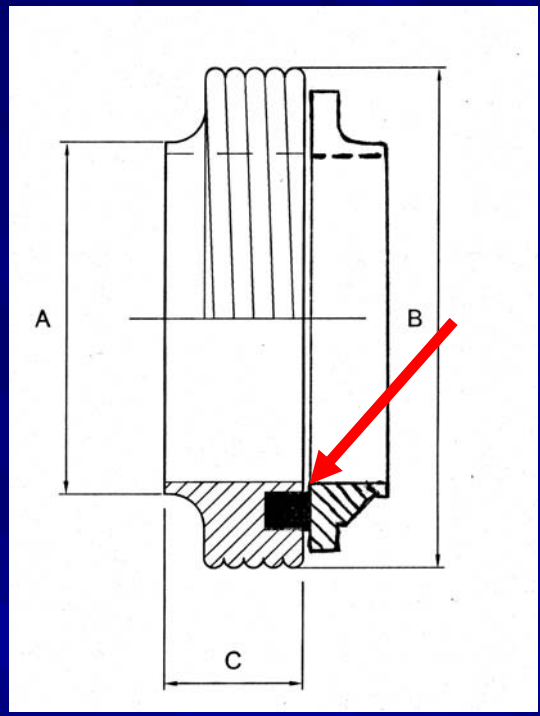


Complies with 3-A and EHEDG Sanitary Design Criteria.

Not currently known if successfully tested for CIP-ability

Profile Seal Type Systems

SMS 1145

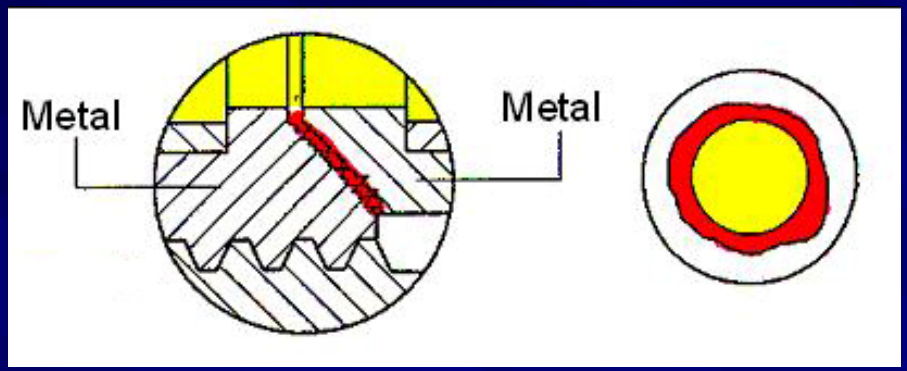


Does not comply with 3-A and EHEDG Sanitary Design Criteria in standard form.

L- Profile gasket available but does not provide self-centering

Aftermarket SMS system successfully tested for CIP-ability. Confirmation of gasket availability and design details not currently known (SMS system with EPDM gasket from Sodime S.A.).

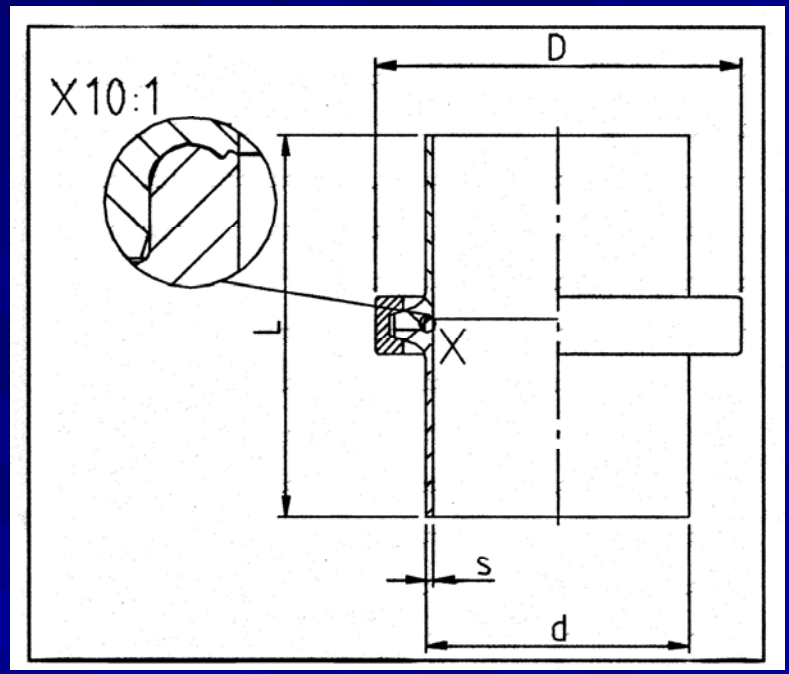
Metal to Metal Type Systems



Bevel Seat type

Does not comply with 3-A and EHEDG Sanitary Design Criteria for CIP.

Designed for COP cleaning.



Neumo Connect-S

Does not comply with 3-A Sanitary Design Criteria for CIP.

Successfully tested for CIP-ability.

EHEDG CIP Tested Pipe Joint Systems

European Hygienic Engineering & Design Group

Position paper of the EHEDG Test Methods Subgroup:

Hygienic Process connections to use with hygienic components and equipment

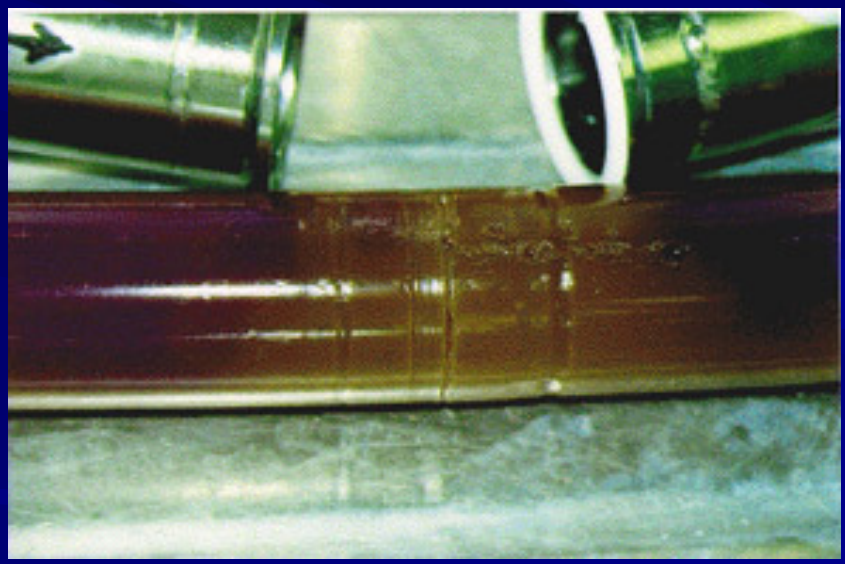
(Version 1, February 2008)

To download the complete document visit www.ehedg.org

Guidelines top menu– Free Documents

Pipe coupling
DIN 11864-1 Form A and B DIN 11864-2 Form A and B DIN 11864-3 Form A and B
Neumo GmbH & Co. KG, Bioconnect® (O-ring)
Neumo GmbH & Co. KG, Connect S®
Kieselmann GmbH, type "K-system"
GEA Tuchenhagen GmbH, HP-SealCon flange coupling
SMS from Sodime S.A., in combination with EPDM gasket
ISO 2852 in combination with the Dupont de Nemours Kalrez/Stainless Steel gasket
ISO 2852 in combination with the Hyjoin PEEK/Stainless Steel gasket
Swagelok TS fitting in combination with EPDM gasket
ISO 2853 in combination with Combifit gasket, EPDM, Viton
DIN 11851 with Siersema gasket

Cleanability Trials on Pipe Joints.



Further Information to be Added as Available: Task Group?

References:

- 3-A Sanitary Standards for Sanitary Fittings, Number 63-03
- Hygienic Pipe Couplings, EHEDG Document 16.
- Specification for Welding of Austenitic Stainless Steel Tube and Pipe Systems in Sanitary (Hygienic) Applications, ANSI D18.1
- Hygienic Welding of Stainless Steel Tubing in the Food Processing Industry, EHEDG Document 35.